AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation

January 1981

OUR JANUARY 5 MEETING will feature a talk on S-100 bus computer systems by Larry Bates, KØLB. The meeting will be held at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA at 7:30 p.m. Guests and visitors are invited.

ELECTION OF DIRECTORS and alternates was held at the December meeting. Elected were:

Jeff Brennan, WB4WLW, Director 1981-82
Bill Pala, WB4NFB, Director 1981-82
Elton Sanders, WB5MMB, Alternate 1981
Dick Barth, W3HWN, Alternate 1981

WE WOULD LIKE TO THANK PERRY WILLIAMS, W1UED, American Radio Relay League Washington Coordinator, for his talk on FCC regulatory activities at our December meeting.

AMRAD's STA REQUEST ON SPREAD SPECTRUM is being hand carried to the FCC Private Radio Bureau on December 18. Stay tuned.

HERE ARE SOME TENTATIVE DATES for hamfests and conventions in 1981:

Jan 11 Frostfest, Richmond, VA
Feb 22 Winterfest, Vienna, VA
Mar 13-15 ARRL National Convention, Orlando, FL
Apr 6 AMRAD/NOVARC/ARRL Technical Symposium, Washington Hilton
May 9-10 ARRL Roanoke Division League Planning Meeting, Tysons Corner Ramada Inn (AMRAD is planning the technical program)
Jun 7 Manassas Hamfest, Manassas, VA
Jun 16-18 AFCEA Show, Washington, DC
Aug 2 SVARC (Winchester) Hamfest, Berryville, VA

A NATIONAL SEARCH FOR IDEAS AND INVENTIONS INVOLVING PERSONAL COMPUTING TO AID THE HANDICAPPED has been announced by The Johns Hopkins University. To be conducted by the Applied Physics Lab of the University, and with the National Science Foundation and Radio Shack, as co-sponsors, the effort will be highlighted by a national competition for ideas, devices, methods and computer programs to help handicapped people overcome difficulties in learning, working and successfully adapting to home and community settings. Categories that may be addressed include computer-based aids for the blind, deaf and mentally retarded; for individuals with learning disabilities, neurological or neuromuscular conditions; and the orthopedically handicapped.

One hundred awards will be made, including a $10,000 grand prize, personal computer equipment, other cash prizes. computer training, and certificates of merit. Entries will be sought from computer specialists, full-time high school and college students, and from interested people generally, including those with handicaps. Regional and national awards will be made in categories. National awards will be presented at a banquet in the fall of 1981 in the Washington, DC area.

Paul Hazan, director of the Personal Computing to Aid the Handicapped project, said the competition is a challenge to the American people to use their conceptual skills in bringing forth practical aids based on computer technology that will help an individual or group of people with a handicap. "Just as important will be the opportunity provided the inventors and developers to make contact and form partnerships with the handicapped in a way that can lead to wide acceptance and use of the new computing technology," Hazan stressed.

Orientation meetings are being scheduled at major rehabilitation centers throughout the United States to bring together potential "inventors," handicapped people and professionals in habilitation-rehabilitation fields. Special presentations also will be made nationwide at chapter meetings of the Associan for Computing Machinery (ACM), Institute of Electrical and Electronics Engineers (IEEE), and personal computing clubs.

Contestants will have until June 30, 1980 to prepare and submit their entries.

To obtain additional information including a descriptive flyer and contest application, write to Personal Computing to Aid the Handicapped, Johns Hopkins University, Post Office Box 670, Laurel, MD 20810. Each entrant must certify that the entry is his/her own. Invention rights remain with the entrant.

THE TEN-WATT GALLON

Raymond C. Petit, W7GHM

Petit Logic Systems

ABSTRACT

Coherent CW is amateur radio's first use of matched filters for digital communication. Extreme frequency precision and time synchronization are required at both transmitter and receiver. The CCW receiving filter uses a dual-channel integrate-and-dump, sample/hold processor operating on outputs of two balanced mixers driven by local-oscillator signals in phase quadrature and zero beat with the desired signal. Slow phase shifts due to propagation produce no nulls in the filter output. A 12-w.p.m. system has a 3-dB bandwidth of about 9 Hz and yields a very credible 20-dB improvement in received signal readibility. A signal buried in noise emerges from the receiver sounding like a code-practice oscillator.

INTRODUCTION

It has been recognized for a long time that the bandwidth used for receiving a signal should be no less and no more than the spectrum width of the signal itself. Wider bandwidths permit unnecessary noise to reach the receiver output, and narrower widths cut off part of the desired signal. This fact has been accepted universally in single-sideband practice and almost never in CW practice. CW receiving filters in use today are typically ten to fifty times wider than the signal. Attempts to use ultra-narrow filters have been thwarted by two obstacles: ringing of the high-Q resonators and the inadequate frequency accuracy and stability of all commercially made amateur equipment. The first obstacle has been overcome by the invention of the CCW filter, and the second is being overcome by home builders who are taking advantage of current developments in low-cost frequency synthesis technology. So far (June 1980) there are about half a dozen CCW stations on the air.

THE COHERENT CW FILTER

Figure 1 is a diagram of the filter. The input is bandlimited to prevent aliasing. The desired mixer outputs x_1 and x_2 are at frequencies near zero. The higher frequency terms are automatically suppressed by the low-pass filtering action of the integrators. With this in mind, let

$$x_1(t) = x(t)\cos(2\pi f_{lo}t)$$

$$x_2 = x(t)\sin(2\pi f_{lo}t). \tag{2}$$

Define

$$x_1(t) + jx_2(t) = z(t) = x(t)\left[\cos(2\pi f_{lo}t) + j\sin(2\pi f_{lo}t)\right]. \tag{3}$$

Then

$$z(t) = x(t)\exp(j2\pi f_{lo}t). \tag{4}$$

If the input signal is

$$x(t) = V_o\cos(2\pi f_s t + \phi) = V_o\frac{\left[\exp(j2\pi f_s t + \phi) + \exp(-j2\pi f_s t - \phi)\right]}{2} \tag{5}$$

Then

$$z(t) = \tfrac{1}{2}V_o(e^{j2\pi f_s t + \phi}e^{j2\pi f_{lo}t} + e^{-j2\pi f_s t - \phi}e^{j2\pi f_{lo}t}) \tag{6}$$

Given that f_{lo} is approximately equal to f_s, only the difference term will contribute significant output after the integration. Let

$$f_b = f_{lo} - f_s \tag{7}$$

the (near zero) beat frequency. Then Eq. 6 is

$$z(t) = \tfrac{1}{2}V_o\exp(j2\pi f_b t - \phi) \tag{8}$$

The integrators are reset every W seconds and allowed to accumulate an integral over W seconds. Thus

$$Y = I + jQ = \int_0^W z(\tau)\,d\tau \tag{9}$$

$$= \frac{V_o\exp(-j\phi)\left[\exp(2\pi f_b W) - 1\right]}{(2)(j2\pi f_b)} \tag{10}$$

When Eq. 10 is multiplied by a factor of 1 in the form

$$1 = \exp(j\pi f_b W)/\exp(j\pi f_b W) \tag{11}$$

and divided by W to obtain the average over the interval W, we have

$$Y = \tfrac{1}{2}V_o\exp(-j\pi f_b W - j\phi)\ \frac{\sin(\pi f_b W)}{\pi f_b W} \tag{12}$$

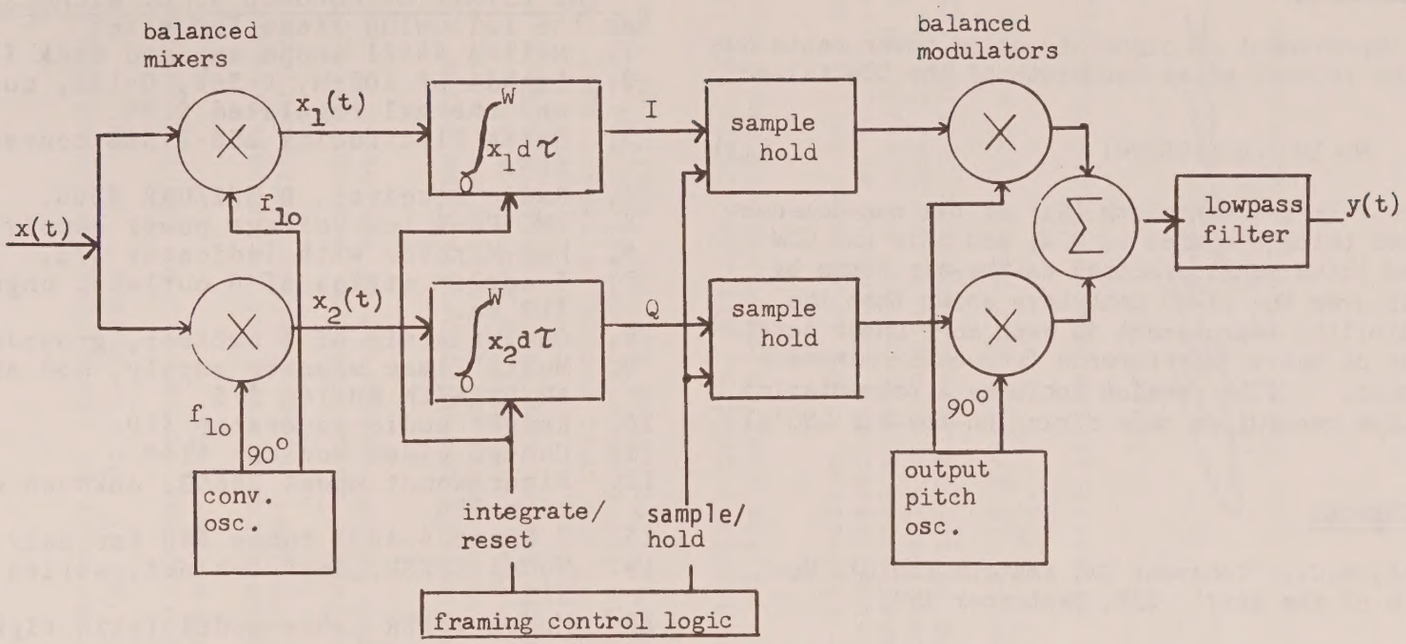

FIGURE 1 : Generic block diagram of the coherent CW filter

Observe two important properties of Y. First, $|Y|$ is independent of ϕ, the arbitrary and unknown phase of the signal carrier. Phase information indeed is present in Y, but to the CW operator's ear, only $|Y|$ has significance. Obtaining this invariance to ϕ is specifically why the filter uses the two-channel phase-quadrature signal-processing path.

The second property is that Y is just the Fourier transform of a rectangular pulse of W seconds. The CCW filter has the same frequency response as the signal it is designed to receive.

To restore Y to an audible tone, the dc levels being held by the samplers feed a pair of balanced modulators driven by a "pitch" oscillator with quadrature outputs. The summing junction performs a vector addition and the lowpass filtered output drives an audio amplifier.

The integrate-sample-hold operation is repeated 1/W times per second, yielding 1/W distinct audio pulses delayed by W seconds from the corresponding input. If x(t) is a steady carrier having no phase drift with respect to the local oscillator, y(t) is also a steady tone. If x(t) is drifting slowly in phase, y(t) is a steady tone with phase discontinuities occurring 1/W times per second, manifest as a distinct popping sound.

Figure 2 is the filter response. If W is 100 milliseconds (for a Morse code speed of 12 w.p.m.) the 3-dB bandwidth is about 9 Hz, nulls occur at multiples of 10 Hz, and the first sidelobes (about 15 dB down) are 15 Hz from center.

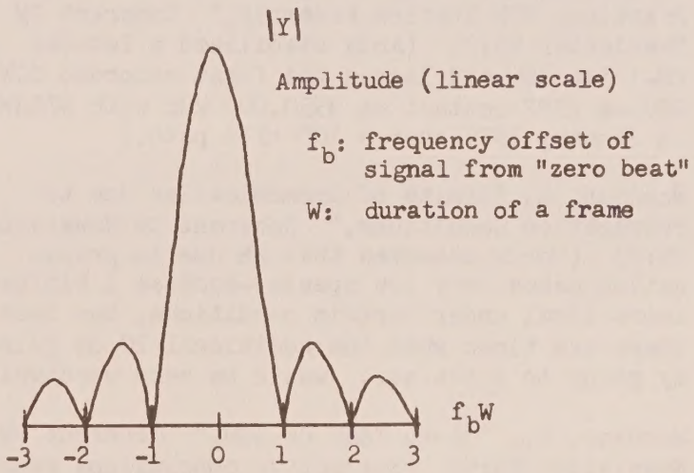

FIGURE 2: Normalized frequency response of the coherent cw filter

SYSTEM REQUIREMENTS

To use this filter in a Morse communication system the transmitter must produce each dit, dah and space in exact multiples of W. The CCW filter is equipped with a "framing" control to synchronize the beginning and end of each integrating period with the timing of each incoming data bit. The standard procedure is for the sending station to transmit a series of dits at the beginning of the initial call. The receiving operator adjusts his framing control for maximum contrast between the audible dits and the spaces between them.

Extreme frequency precision is also required. The overall accuracy needs to be in the order of 1 Hz for 12 w.p.m. codespeeds. The first requirement for a CCW station is a frequency standard with accuracy and stability in the order of one part in 10^8. Every frequency-generating circuit in the station should be phaselocked to this standard. Home builders have invented a number of novel methods for stabilizing their commercial equipment and low-cost frequency synthesizers for 9-MHz IF systems have been described in the literature.

PERFORMANCE

The improvement in signal-to-noise power ratio due to the reduced noise bandwidth of the CCW filter is

$$M = 10 \log (10B/9R) \qquad (13)$$

where B is the bandwidth (Hz) of the non-coherent filter being compared to CCW, and R is the CCW speed (bits/sec). Actual on-the-air tests by W6NEY over the JA-W6 path have shown that the readibility improvement is even more under conditions of heavy interference from other man-made signals. (The session includes a presentation of tape recordings made during on-the-air QSO's)

REFERENCES

Petit, R.C., "Coherent CW: Amateur Radio's New State of the Art?" QST, September 1975

Petit, R.C., "Fundamentals of CCW" Coherent CW Newsletter 75:7 (This is a non-mathmatical derivation of the CCW filter frequency response)

McCaskey, Andrew L., "The Coherent Ten-Tec: A Practical CCW Station Assembly," Coherent CW Newsletter 75:24 (Andy stabilized a Ten-Tec PM-1 for CCW and logged the first recorded CCW QSO--a QRPP contact on 3550.000 kHz with W7GHM in January 1975 over a 100 mile path.)

Woodson, C, "Limits of Communication due to Propagation Conditions," Coherent CW Newsletter 75:23 (Woody observes that FM due to propagation makes very low speeds--such as 1 bit/sec--impractical under certain conditions, but that there are times when the additional 20 dB gained by going to 1 bit/sec. would be very worthwhile.)

Woodson, C., "JA-W6 TEST OF CCW," Coherent CW Newsletter 75:51 (Subjective conclusions reached from several hours' observations indicate theoretical analysis of CCW improvement will be realized in practice.)

Petit, R.C., and Woodson, C, "Receiver Design for CCW," Coherent CW Newsletter 75:44

Weiss, A. "Coherent C.W.--The C.W. of the Future" CQ, June 1977 (A very readable and enthusiastic review of CCW theory and practice)

Petit, R.C., "Frequency Synthesized Local Oscillator System for the High Frequency Amateur Bands," Ham Radio, October 1978

Petit, R.C., "Phase Locked 9-MHz BFO," Ham Radio, November 1978

Petit, R.C., "Phase Locked Up Converter," Ham Radio, November 1979

THE ESTATE OF COLONEL J. E. NICHOLSON, SR has the following items for sale:

1. Millen 90921 scope amp and rack $30.
2. Lambda LE 103-M, 0-36V, 0-15A, current and thermal regulated $100.
3. Delta Electronics LSB-1 SSB converter $15.
4. Radio receiver, R-392/URR $200.
5. TMC PS-4 low-voltage power supply $10.
6. Ham-M rotor with indicator $75.
7. 3 outlet strips of 6 outlets, ungrounded $12 ea.
8. Outlet strip of 6 outlets, grounded $15.
9. Multi Elmac w/power supply, mod AF 67, AM/NBFM/CW 80-10m $75.
10. Knight audio generator $10.
11. Conrac video monitor $150.
12. Floor-mount Model 28KSR, unknown condition $75.
13. 2 Eimac 4-400A tubes $80 for pair.
14. Model 28KSR, desk cabinet, series motor $75.
15. Model 28KSR table model (skin-tight cabinet) $50.
16. Model 35ASR $250.
17. Model 35ASR $200.
18. 28RO, bad case $50.
19. 28KSR $100.

20A,B,C,D. Model 28 typing reperf $50 ea.
21A,B,C. Model 28RO $50.
22A,B. M28 3-speed printing reperf $50 ea.

23. M28 stand-alone TD $50.
24. Double 28 TD, triple case $40.

25A,B,C. Triple M28 TD $50.

26. M35 typing reperf, keyboard $100.

A. DT 600 RTTY demod with scope display $175.

B. XT-4 shifter $125.
Two panels. Dedicated receiver/transmitting (osc), with digital clock, Osc (XTL) for MARS freqs, (RTTY) 4020, 4025, 4030, 4035 plus some 3 MHz.

C. XT-4 p-c boards (8) $2.50 ea.
D. UT-4 w/TX/RX speed converter $200.
E. Model 28ASR, 100 wpm, 7-unit code $200.
F. Hewlett Packard 5382A 225-MHz counter $250.
G. Johnson Viking II $60.
H. HAL DS 3000 KSR video terminal, Baudot/ASCII to 1200 baud $600.

Rohn tower consisting of following parts $175:
- 25G two 10-foot sections
- AG25-4 one flat-top section
- TB-3 thrust bearing
- AS25G Ham-M rotor shelf
- GA25G guy assembly w/torque bars
- GB25G guy assembly w/o torque bars
- BR35 (3/16) guy wire clamps

Two 11-element 2-meter beams $25/pair.
One 6-element 2-meter beam $10.
Premax #SS1135, stainless steel telescoping vertical antenna - 6 sections, 6 ft 4 in, extended 35 ft 7 in $125.

The above items were inventoried by AMRAD members John Bresnahan, WB4YMT, and Walter Stewart, W4UBE on November 22, 1980. If you are interested in any of these items, please contact Mrs. Nicholson on 703-256-0716 and make an appointment to see the gear.

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

NOV 21 1980

IN REPLY REFER TO:
7110-6

Mr. William C. Meyn
1870 Faraday Drive
Reston, VA 22090

Dear Mr. Meyn:

In response to your letter dated September 17, 1980, Special Temporary Authority is hereby granted to the Amateur Radio Station licensees listed below to permit transmission of the digital teleprinter code described in CCIR Recommendation 476 (Rev. 74) for the purpose of conducting experiments to develop an error-free mode of amateur teleprinter communicatons.

Licensee	Call Sign
William C. Meyn 1870 Faraday Dr. Reston, VA 22090	K4PA
Charles A. Roettcher 2853 Ontario Road, NW, #601 Washington, DC 20009	K3FLS
Melvin Leibowitz 25 Holly Hill Road Wilmington, DE 19809	W3KET
Walter E. Kaelin 12332 Saragler Dr. Saratoga, CA 95070	KB6BT

Section 97.69 is waived only to the extent to permit this operation. All operations conducted under this temporary authority are subject to the following conditions:

1. All stations must be identified in accordance with 97.84(a) of the FCC Rules.

2. This authority may be revoked by the FCC in its discretion at any time.

3. Harmful interference will not be caused to any licensed stations in the Amateur Radio Service.

4. You are afforded no protection from any interference caused by the operation of any other licensed station.

5. You are to notify the appropriate Commission office prior to commencement of any operation in accordance with the recent conversation you had with Mr. Ralph Haller of our Field Operations Bureau.

6. At the end of the test period, a report must be submitted to the Commission detailing the types of experiments conducted and the results of these experiments.

7. Except as herein provided, all applicable sections of Part 97 of the Commission Rules and Regulations apply.

8. No waiver of Section 97.69 is granted for any additional amateur stations. Extension of the waiver to include additional stations must be considered on a case by case basis upon application made to the Commission by the additional amateur stations involved.

9. This authority is granted for the period ending November 30, 1981.

We appreciate your interest in the Amateur Radio Service.

Sincerely,

Carlos V. Roberts
Chief, Private Radio Bureau

William C. Meyn, K4PA
1870 Faraday Drive
Reston, Virginia 22090
September 17, 1980

Mr. Richard Everett, Division Chief
Private Radio Bureau, Licensing Division
Federal Communications Commission
Washington, D.C. 20554

Dear Mr. Everett,

I am writing on behalf of a group of amateur radio teletype enthusiasts who are interested in transmitting a relatively new type of teleprinter code. We understand that a temporary waiver of rule 97.69 may be obtained for several stations to begin experiments as quickly as possible.

We desire to transmit a teletype code described in C.C.I.R. Recommendation 476 (Rev.74) which is similar to the commercially used "Moore ARQ code". These differ from the Baudot and ASCII codes in the following respects:

1. The data bits are sent synchronously without adding Start and Stop bits.
2. Extra bits are added to each character (there are a total of seven) to provide error detection capability.

Our use of CCIR 476 will involve no differences with Baudot or ASCII as far as modulation requirements are concerned. The frequency shifts and baud rate limitations currently governing ASCII transmission are entirely satisfactory. Thus, there will be no adverse effect on other amateurs. Also, there will be no difficulty in observing the present CW identification requirement.

The purpose of our experiments is to develop an error-free mode of amateur teleprinter communications. If successful, this effort may become a milestone contribution to amateur radio traffic handling and digital data communications in the High Frequency spectrum. We expect to petition the Commission for an appropriate rules change as soon as technical feasability is demonstrated. I believe that Docket 20777, in which ASCII was recently authorized, alludes to the eventual authorization of other teleprinter codes.

We wish to begin our experiments by implementing the simplex ARQ system described in CCIR 476. The data are transmitted in blocks of three characters with pauses to listen for the receiving station acknowledgment between the blocks. It is with this means that error-free copy is achieved. The error detection feature built into the CCIR 476 code enables receiving stations to determine whether correct copy has been received. If not, a request to re-transmit is sent between the blocks. As described in the CCIR document, the transmission rate is 100 baud and the data rate to the teleprinter is 50 baud. The time required to listen for and receive the acknowledgement accounts for the difference between these two rates.

Equipment for this mode of teletype communication is already manufactured by several U.S. and foreign companies. It is apparently intended for shipboard use where installation of a full duplex ARQ system is difficult. British amateurs have pioneered an amateur version called AMTOR (for Amateur Microprocessor Teleprinter Over Radio). As you might imagine, the currently popular microcomputing equipment is eminently suited to these endeavors. Great Britain has already authorized this service for its amateurs, apparently on the strength of its comprehensive description in the CCIR document.

Several U.S. amateurs now posess specialized equipment to operate with AMTOR. Others have suitable microprocessing equipment and have expressed an interest in this mode. Their letters requesting waiver of 97.69 are enclosed. We propose that authorization to transmit teletype signals in accordance with CCIR 476, on all frequencies currently available for RTTY, be granted for a 1 year period so that experience may be gained under varying propagation conditions. At the end of that time a report of our findings will be submitted to the Commission.

I am including some background material which I believe will be helpful to you. Naturally, we wish to begin operation as soon as possible and solicit your advice on regulatory procedures. I am available during business hours at my office in Reston (Tel. 703-471-9259) and will be pleased to answer any questions.

Sincerely,

William C Meyn

William C. Meyn, K4PA

encl:
Other waiver requests (3)
C.C.I.R. Rec. 476
Radio Com. AMTOR article
Frederick 1620A Brochure

cc. Michael Marcus

THE DEAF AND THE TTY

Barry Strassler
Executive Director
Telecommunications for the Deaf, Inc.
814 Thayer Avenue
Silver Spring, Maryland 20910
TTY 301-589-3006

EMERGENCE OF ASCII ON THE DEAF SCENE

Communications engineers propose ASCII. Home computer hobbyists prefer ASCII. Research scientists tout ASCII. The thinking of the FCC leans towards ASCII. The deaf TTY/TDD network is a Baudot territory, and its members are 75,000 strong. Do the deaf prefer the Baudot code over the ASCII code? Not quite, as virtually all of them are totally unaware of the ASCII/Baudot controversy. It was a technical choice made years ago -- in other words, no choice. Are the deaf complaining? They're not likely to untill they fully realize the advantages of ASCII over Baudot. But for now, they are content as is, with the ease and simplicity of Baudot TDD's.

There are more implications of ASCII than what is being bandied around in discussions and in published essays. The question is - if ASCII, fine, but what kind of modem. Should it be the Bell 103 modem or the present TDD modem? Several manufacturers are leaning towards either one of the two directions. If such a schism occurs, then incompatibility occurs. The deaf people need incompatibility like a proverbial hole in the head.

There are "black box" converters or translators which can bridge the ASCII-Baudot gap. Perhaps for this coming decade or so this is the best solution. But this still does not satisfactorily answer the lingering question - which modem? One TDD manufacturer came up with an adapter to communicate on either Baudot or ASCII code using the present TDD-type modem. And, they found themselves criticized for ignoring the Bell 103 modem features.

Most of the TDD's in Europe (not that many, though, as compared to the States) is on 8-bit, 110-baud code. There is a small network of deaf TRS-80 (*tm Radio Shack*) users in Connecticut that base the present TDD modem on the ASCII code, thus creating an isolated network. Fortunately, this TRS-80 TDD has a dual modem capacity, so compatibility is preserved.

This problem becomes especially acute when more and more Model 33 teletypewriters are available as surplus. It would be much easier to use them as is on ASCII than to get involved in conversion to Baudot. But if left alone, the Model 33 is incompatible with the present TDD network.

This is not all; there is a saying that the deaf are a generation behind the latest technological innovations. They receive Model 15 machines when Models 28 and 32 are commonplace; they receive Model 32 machines when Model 42's are used. Then, perhaps a decade later when the Model 42 is outdated, ASCII might become *passe* in favor of a newer code if technology continues at the present pace!

A CALL FOR PAPERS has been made for "Crisis in Computing: Innovation in a Constrained environment" -- the 20th annual technical symposium of the Washington, DC chapter of the ACM, June 18, 1981, at the University of Maryland Center of Adult Education, College Park, MD. By January 13, submit five double-spaced manuscripts of a paper not previously published to the Program Vice-Chairman, Wilma M. Osborne, Technology Bldg, Rm B265, National Bureau of Standards, Washington, DC 20234. A length of 10 to 20 pages is strongly suggested. Brief 400-word summaries on current research will also be considered. Authors will be notified by March 6.

A CALL FOR SPEAKERS AND SESSION LEADERS for the 6th West Coast Computer Faire, to be held in San Francisco's Civic Auditorium April 3-5, 1981, has been issued. People who have created interesting microcomputing applications or projects, or have other information of interest to the small computer community, are invited to submit proposals to speak or organize conference sections for the 3-day convention. Prospective speakers and conference section organizers can obtain further details from Computer Faire, 333 Swett Rd, Woodside, CA 94062, or phone 415-851-7075. Papers accepted at the Faire are published in the Faire's *Conference Proceedings*, available at the Faire.

PROTOCOL

David W. Borden, K8MMO
Rt 2, Box 233B
Sterling, VA 22170
703-450-5284 (Metro No.)

I must apologize for dropping out of action again, but I made a trip to a small remote island in the Indian Ocean to install a new computer, and they had no packet repeater. I hope that any future trips to that place are shorter. They did have amateur radio but were heavily into phone patches back home and such.

This month it occurred to me that it was time to renew my AMRAD membership. I have forgotten this for however many months, and the club has been nice to me and continued sending me news. In the process of renewing AMRAD, I began to think again about that old institution, the American Radio Relay League (ARRL). Probably more than one of you out there began your amateur radio experience by reading a League publication, either the License Manual or The Radio Amateur's Handbook, or both together, as I did. Eventually however, as my ham radio experience widened, the League publications, principally *QST*, the magazine, did not keep up with my interest. I was forced to read other publications to keep abreast of the latest news, construction articles, theory, etc. It then came to me in a flash one day, "why am I subscribing to *QST*, or because it is a package, why be a League member?" My League membership did serve me well while I was involved in the National Traffic System (NTS), sending and receiving message traffic on 80-meter CW. That is in fact what the League is all about -- relay. In Hiram Percy Maxim's day, that was very important. But, without blasting NTS too badly, it takes a long time to get a message through the system. At this point, a quick review of the NTS should be valuable. A message is entered into thesystem at the Section (state) level having been collected by a local net representative earlier, possibly. A representative takes messages to be forwarded to a Regional net (covering a call area with 10 call areas forming the Continental U.S.). Another representative there takes the message to an Area net (Time Zone). After traffic is cleared at the Area level, the representatives go back to their Regional net with return traffic (typically from the night before). The typical timing sequence is:

1900 Section Net
1945 Regional Net
2030 Area Net
2130 Regional Net resumes
2200 Section Net resumes

This is all most instructional because we see where the super-smart packet repeaters need to be placed. You might also notice that for the present NTS to work, it requires dedicated loyal people to check in every night and give up their whole evening to do the job. You might also notice that interconnected CBBS-type nodes would also do this job well, but amateur packet radio has a better chance of getting off the ground.

What has all this to do with protocol and computers and packet radio? Everything! I advocate the formation of a packet radio network (Paul Rinaldo, W4RI, wants to call it "AMNET") of radio amateurs. Other people are concerned with the creation of a digital radio license and allowing other people on the net such as the deaf community, etc. I want to originate a message here in Northern Virginia and have it arrive in Redondo Beach, California several minutes later, maybe. A network of smart packet repeaters can do this job. To quote a time-honored trite phrase, "We have the technology". I am upset that while the Canadians are already well into this, we, the United States radio amateurs are far behind and dragging our feet. I want to beat the Post Office or whatever bureaucracy eventually gets involved with electronic mail at their own game. None of these ideas is original with me -- I am just trying to spread them and get some action. But, one would expect the ARRL to be right on top of all this. They are not on top of what can be the best network ever, and I think that it is partly my fault. I ignore them; I am not a member; I do not send them articles talking about the latest technology (they do not pay money -- other magazines do) and neither do my friends who also experiment with new ideas. I took care of the first problem; I joined the ARRL (once again) and hope to write some articles about digital communication, packet radio and computers. Why bother, you ask? Why not just go ahead and form the greatest

packet radio network ever and bypass them altogether? In short, what can they do for us? I think that they can speed the whole process up and help maintain the network. I think that amateur packet radio will work, and a network will eventually get going, because it is a super idea. But it will be a slow process. It will be implemented by experimenters, and possibly it will suffer the experimenter syndrome as I define it:

> Once an idea is implemented, tested and proven, it is dropped for new ideas because the old idea is now old by definition.

The network will require daily usage to continue growing. I am not going to accept outside traffic from uninitiated citizens and forward it to their Aunt Millie in California, but *someone* should. I want to trade ideas and implement a conferencing text editor (like FORUM or CONTEXT, which might be familiar to some) and trade software. While I am having all this selfish fun, someone needs to be handling the general public.

This network needs to be expanded so that in time of emergency it will be a true national asset. It is better than FM voice or CB voice and can be important in wartime or in disasters. The League has the charter for all of this now. I do not think that amateur FM voice or SSB voice can hack it in time of emergency, on a national basis. I may be wrong, but I think that packet radio can work in a pinch.

So, my New Year's resolution for 1981 is to try to help the League, in some small way, to go digital. I must begin by getting packets on the air from K8MMO. I have chosen the quickest, but most expensive, approach to this, building the Canadian board. I am doing this even against my own thinking which always wants a job accomplished in the most inexpensive manner, using existing hardware and writing new software where required. W4RI and W4MIB will also be building these boards. Let us try and not forget the League -- they are a great untapped resource that could help us with nationwide coverage and maybe even financial backing.

A TELETYPE CORP. 28RO is available from Bill Pala, WB4NFB, for a reasonable donation to the Reddington memorial fund. Please call 703-323-8345.

HELP! Roger Schwartz of Mount Vernon, VA is looking for someone who lives nearby or works in Crystal City to help him over an occasional rough spot in a correspondence course in elementary electronics and microcomputers. Call 557-2226 or 557-7418 (work) or 360-7413 (home).

AMATEUR RADIO LICENSE REVIEWS FOR TRS-80 are available from Micro-80, Inc. 2665 N Busby Rd, Oak Harbor, WA 98277. $19.95 - specify General, Advanced or Extra Class.

THE GEORGE WASHINGTON UNIVERSITY Continuing Engineering Education, Washington, DC announces the following short courses:

451	Digital Encoding and Processing of Voice and Video, Jan 7-9
382	Transmission Characteristics of the Switched Telephone Network, Jan 19-23
336	Advances in Electronics Technology, Jan 26-30
651	Applied ECM, Mar 2-6
537	Wideband Communications Systems, Mar 9-11
241	Modern Data Communications, Mar 16-20
617	Japanese Methods for Productivity and Quality, Mar 16-19
302	Spread Spectrum Comm. Systems, Mar 16-20

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of about 300 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the *AMRAD Newsletter*. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to all members and to other clubs on an exchange basis. Technical articles, new product announcements, news items, calls for papers and other copy related to amateur radio and computing are welcome. Honorariums at a rate of $10 per printed page ($20 maximum per author per issue) are paid for original material accepted. Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceeding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave, McLean, VA 22101; phone 703-356-8918. Full permission for reprinting or quoting items appearing in the *AMRAD Newsletter* is granted provided that credit is given. Mailing is by 3rd Class bulk mail to U.S. addresses and 1st Class to Canada and Mexico. Overseas readers add 60¢ for surface or $5.64 for air mail to annual dues.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

AMRAD OFFICERS for 1981 are:

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THE AMRAD LIBRARY is operated by Tedd Riggs, KA4FYU, 8402 Berea Ct, Vienna, VA 22180, phone 703-573-5067. Donations of technical books, magazines, manuals and catalogs are tax-deductible.

AMRAD IS AFFILIATED with the American Radio Relay League (ARRL), the Foundation for Amateur Radio, the Northern Virginia Radio Council (NOVARC) and The Mid Atlantic Repeater Council (T-MARC).

SPECIAL INTEREST GROUPS are formed from time to time. Currently we have SIG's on Deaf Communications and Spread Spectrum Communications. If you are interested in joining or forming a SIG, please contact Bill Pala, WB4NFB, 5829 Parakeet Dr, Burke, VA 22015; phone 703-323-8345.

TRAINING CLASSES are run as needed. Please discuss your training requirements with any Director.

AMATEUR RADIO RESEARCH AND
DEVELOPMENT CORPORATION
1524 SPRINGVALE AVENUE
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